THE WALTER AND ELIZA HALL INSTITUTE OF RESEARCH IN PATHOLOGY AND MEDICINE

FOURTEENTH ANNUAL REPORT 1932-33

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The Institute has sustained a severe loss in the death, on 17th May, of Sir Leo Cussen, Acting Chief Justice of Victoria. Sir Leo Cussen had represented the Walter and Eliza Hall Trust on the Board of the Institute since its inception. In spite of the many public duties connected with his office, and though his health was by no means robust, Sir Leo was always ready with his expert advice to assist in all matters pertaining to the work of the Institute, and the loss of his wise counsel and sympathy will be a very severe one.

The Fourteenth Annual Report

OF THE

Walter and Eliza Hall Institute of Research

July, 1933.

In spite of financial difficulties, the work of the Institute has been carried on satisfactorily, without any reduction of staff, though it has been necessary to maintain the salaries at reduced rates and to practise the strictest economy in the purchase of apparatus and materials. The Felton Bequest have continued their help to us, and we are also indebted to them for the gift of an Edinger Projector, costing £100; the Mackie Trust have given us £100, and the Sumner Trust £20 this year, but even with this generous help our expenditure slightly exceeds our income.

The "Elsie Marion Carty" Fund.

The late Mrs. L. E. W. Carty, of Brisbane Hill, Hamilton, has willed to this Institute a portion of her estate and a residuary interest therein to establish the "Elsie Marion Carty" Fund. It was her wish that the income of this fund should be applied to assisting promising workers, who would not otherwise have sufficient means to devote themselves to research, in Medicine and Pathology. Last year the income was £345. It is hoped to make the first appointment to a Carty Fellowship during the coming year.

Our thanks are due to Professor W. A. Osborne, of Melbourne University, for the loan of a spectroscope, on which Mr. Holden was enabled to carry out some important work during several months.

After nine and a half years' service, the Director has been granted leave of absence for eleven months, and sailed for England early in February. He is spending some time in England and in Europe in order to keep in touch with recent developments in research, and, through the generosity of the Rockefeller Foundation, is to visit the United States for the same purpose.

During Dr. Kellaway's absence Dr. Ivan Connor is Acting Director.

Mr. H. F. Holden has been granted nine months' leave of absence, and is now working in Cambridge in Professor Sir Gowland Hopkins's Laboratory.

Last year the Institute was honoured by the award to its Director, by the Royal Society of New South Wales, of the Walter Burfitt Prize and Medal. This prize is awarded every three years to a worker in pure or applied science resident in Australia or New Zealand whose publications during the preceding three years are deemed of the highest scientific merit.

The Work of the Institute.

Australian Snake Venoms.

We have continued the collection of snakes and of their venoms, and have been able to supply the venoms necessary for carrying on the immunisation of horses at the Commonwealth Serum Laboratories for the preparation of tiger snake and copperhead antivenines. Our collection of snakes has been housed, as heretofore, at the Melbourne Zoological Gardens, and our thanks are due to the President, Council and Director for facilities placed at our disposal.

This year we have collected or purchased 93 tiger snakes, 107 copperheads, 13 brown snakes, and 3 black snakes. We still have left a few of the black tiger snakes purchased in February, 1931.

Of the venoms we have collected 0.14 grammes of death adder, 22.8 grammes of tiger snake, 5.1 grammes of black tiger, 10.3 grammes of copperhead, .21 grammes of black snake, and 0.06 gramme of brown snake venom. By the courtesy of Professor H. G. Chapman, a small supply of the venom of Hoplocephalus bungaroides has been made available.

The Peripheral Action of Australian Snake Venoms.

The first three papers in a series dealing with this subject have been published. They have been concerned with the curari-like action of the Australian venoms on frogs and mammals.

The frogs studied were two Australian species, *Hyla aurea* and *Lymnodynastes dorsalis.* Intact and pithed frogs of the first species were not very susceptible to this action of the venoms, but curarisation could more readily be displayed in the latter species. It was, however, much more regularly shown in experiments on isolated nerve muscle preparations from these species of frogs, and nearly all the venoms tested produced curarisation in isolated gastrocnemius-sciatic preparations of *Hyla aurea.* These included the venoms of Australian snakes

—*Demansia textilis,* the brown snake; *Denisonia superba,* the copperhead; *Pseudechis porphyriacus,* the black snake; *P. australis; Acanthophis antarcticus,* the death adder; *Notechis scutatus,* the tiger snake; and *N. scutatus var. niger,* the black tiger snake. The venom of *Oxyuranus scutellatus* (a much denatured specimen, which, however, exhibited strong curarising action in mammals, was without effect. Of the foreign venoms those of *Naia naia,* the Indian cobra; *Bungarus coeruleus,* the common krait; *B. fasciatus,* the banded krait; *Naia hannah,* the King Cobra; *Enhydrina schistosa,* a sea snake; *Echis carinata,* and *Crotalus adamanteus* caused curarisation, but that of *Vipera russelli* (the daboia) failed in high concentration.

Direct action on the irritability of muscle was most striking with the venoms of *Naia naia, Bungarus coeruleus, B. fasciatus* and *Pseudechis porphyriacus;* somewhat less so with the venoms of *Denisonia superba* and *Pseudechis australis,* and only slight with the remaining venoms in the concentrations used (1 : 10,000 to 1 : 2,000).

Comparison of the changes of indirect and direct chronaxie under the influence of curari and of snake venoms in appropriate concentrations showed no significant differences, and the isolated muscle immersed in venom solution exhibited imbibition most strongly in those venoms which exhibited the most striking effect on muscle irritability.

The direct effects on muscle of Australian snake venoms were fairly closely paralleled by the haemolytic action of the venom on washed mammalian erythrocytes (man, horse, dog, rabbit and guinea pig). This result favours the hypothesis of Houssay, that direct action on muscle is due to the action of lecithinases on the permeability of the muscle cells.

The action of the same group of venoms was studied in mammals, chiefly in rabbits. Of the Australian snake venoms, the only one which failed to cause curarisation was that of *Pseudechis australis,* a large brown-coloured snake from Northern Queensland. Curarisation was also shown with the other foreign venoms, but appeared to play no part in causing death in the two viperine venoms studied, those of *Echis carinata* and *Vipera russelli.*

By amplifying the nervous impulses down the phrenic nerve and recording them aurally with a loud speaker, we were able to show that after failure of respiratory movement, which normally causes death by asphyxia in animals poisoned with snake venoms, the respiratory centres were still active, and impulses could still be heard passing down the phrenic nerves, though curarisation of the diaphragm was well advanced, if

not always complete. That these impulses indicated continued activity of the nervous centres of respiration was shown by their absence, when the cord was sectioned high in the cervical region, or the bulbar region was anaesthetised by a local anaesthetic, and in apnoea, however produced, by the changes produced in them by drugs having a central depressant action and by their increased intensity under the influence of CO_2 or asphyxia or following the injection of drugs with a stimulant action on the respiratory centres.

This work was possible through the co-operation of Mr. R. O. Cherry, Physicist to the Radio Research Board, who designed for us the amplifier used in these experiments.

An attempt was made, by applying moderate concentrations of venom to the floor of the fourth ventricle, to ascertain whether venoms have, in addition, any direct central action. There are some indications that this may be the case, but it is clear that the slight central effects play no important part in causing death.

The third communication of this series was concerned with the reversal of this curarising action by antivenine. It was shown that curarisation by the venoms of the copperhead and tiger snake could be reversed by monovalent antivenines prepared by Dr. F. G. Morgan at the Commonwealth Serum Laboratories. This reversibility was much more difficult to demonstrate than the corresponding phenomenon with cobra venom, which had earlier been investigated by Arthus. This worker was able to administer antivenine earlier after the injection of cobra venom than was the case in our experiments, because this venom is more predominantly curari-like in its action.

The added direct effect of Australian snake venoms on the muscle of the diaphragm was found to be very difficult to reverse when well established; indeed, there was no clear evidence of its reversibility. If long periods of unopposed action were allowed to tiger snake venom, this direct effect on muscle irritability became fully developed, but short periods of unopposed action of tiger snake or copperhead venoms could be efficiently counteracted by the administration of sufficient antivenine and the maintenance of prolonged artificial respiration.

Publications.

The Peripheral Action of the Australian Snake Venoms:

Kellaway, C. H., and Holden, H. F.:

1. "The Curari-like Action in Frogs." "Australian Journal of Experimental Biology and Medical Science," 10 (1932), 167.

Kellaway, C. H., Cherry, R. O., and Williams, F. Eleanor:

2. "The Curari-like Action in Mammals." "Australian Journal of Experimental Biology and Medical Science," 10 (1932), 181.

Kellaway, C. H.:

3. "The Reversibility of the Curari-like Action." "Australian Journal of Experimental Biology and Medical Science," 10 (1932), 195.

Snake Venoms as Muscular Poisons.

This formed the subject of Dr. Kellaway's Presidential Address to Section N at the meeting of the Australian and New Zealand Association for the Advancement of Science at Sydney in August, 1932.

Dr. Kellaway discussed the evidence upon which the symptoms following the bites of the *Colubridae* have been regarded as due to direct action of venom on the central nervous system. "There was no satisfactory evidence of such action; the incoordination and paralysis of the skeletal musculature could be explained by peripheral action of the venoms, and the "starting movements" were almost certainly asphyxial in origin. The microscopic changes in the central nervous system of animals dying from the effects of snake venom, described by earlier workers, were probably due to chronic oxygen lack, and no proof to the contrary had ever been brought forward. The action of snake venoms in causing failure of respiratory movement, which was the actual cause of death, was also peripheral. Curarisation, if not an actual direct effect on skeletal muscle, at least took place peripheral to the nerve endings, and in any case was accompanied by a direct action on skeletal muscle itself. There was also the direct action of snake venoms on cardiac muscle and upon the smooth muscle of the vascular system. The Australian venoms had a peculiar action on smooth muscle, which in some ways resembled the anaphylactic response of sensitive plain muscle; the muscle having once contracted in response to a dose of venom, was desensitised, and failed to react to another dose of the same or a similar venom. This action could be demonstrated on the smooth muscle of the uterus. A similar phenomenon was observed in the vascular response to intravenous injection of venom. An initial injection caused a transient fall of pressure, which could not be reproduced by a second similar dose."

These grounds seemed to be sufficient for regarding the Australian venoms at least as being predominantly muscular poisons.

Haemolysis by Australian Snake Venoms.

The haemolytic power of Australian snake venoms was compared by *in vitro* tests upon the washed red blood corpuscles of man and of the horse, dog, cat, sheep, rabbit, and guinea pig, both with and without the addition of the sera. The order obtained was in general agreement with that given by subcutaneous injection of the venom into animals. The venoms of the black snake and copperhead were the most active of the Australian venoms tested, being of the same order of potency as the venom of the cobra. Tiger snake and death adder venoms, though much less active, were next in potency, and the venom of the brown snake had the least powerful action.

These tests divided the blood corpuscles used into three groups: (1) Those not haemolysed either in the presence or absence of serum, (2) those haemolysed by venoms without an activator and inhibited by serum, and (3) those with which haemolysis was accelerated by serum. The tests also divided the Australian venoms into two groups: (1) Those which haemolyse directly without serum activation, and (2) those with only a slight action upon washed erythrocytes.

Haemolysis by Australian snake venoms is essentially similar to that by other venoms. It depends upon a lecithinase acting at the limiting surface of the corpuscle, and is subject to the same ionic influences at this interface as is cobra venom.

Complement plays an insignificant part in haemolysis by the Australian venoms.

Though they cause partial inhibition of haemolysis when present in excess, the venoms do not behave like cobra venom in rendering susceptible corpuscles more resistant to the action of other lytic agents.

Inhibition by serum is a frequent phenomenon in haemolysis by Australian venoms. Since it is not constantly associated with diminution in the swelling of the cells, which normally precedes venom haemolysis, it is unlikely that it is due to deviation of venom to the serum.

Australian snake venoms are adsorbed to red blood corpuscles when left in contact with them at 0°C. and the thoroughly washed corpuscles haemolyse when warmed. Serum in the absence of venom is not adsorbed to red blood corpuscles, but cells treated in the cold with both serum and venom, and subsequently washed, do not haemolyse when warmed. If, therefore, deviation of venom to the serum can be excluded, serum inhibition must depend upon the interaction of venom and serum at the limiting surface of the cells.

Apparently the whole serum-protein-lipoid complex is essential to this action, since opposite effects are produced by serum proteins deprived of their lipoids, whereas the lipoids alone invariably activate haemolysis.

Publication.

Kellaway, C. H., and Williams, F. Eleanor:

"Haemolysis by Australian Snake Venoms."

1. The Comparative Haemolytic Power of Australian Snake Venoms.
2. Some Peculiarities in the Behaviour of the Haemolysins of Australian Snake Venoms.

"The Australian Journal of Experimental Biology and Medical Science," Vol. xi, 1933.

Biochemical Department.

The Fractionation of Snake Venoms.

Mr. Holden has investigated the problem of removing thrombins from venoms containing them without resort to preferential thermal inactivation, since heat has a deleterious effect upon other constituents of the venoms. Ultrafiltration at low pressures through celloidin membranes was found to be unsatisfactory, since the filtrable constituents tended to drag the normally unfiltrable protein through the filter. It was hoped to avoid this difficulty by filtration at high pressures by Martin's method, using Martin's original apparatus, which was kindly lent by Professor W. A. Osborne. Reasonable yields of toxic constituents other than thrombin of black snake venom were not obtained without passage of traces of thrombin, and the method was unsuitable for the preparation of large amounts of venom freed from thrombin.

Adsorption with a large number of insoluble substances which were subsequently removed by centrifugation was now attempted, and of these the best was Barium carbonate, prepared in a very finely divided state by passing CO_2 into a watery solution of Barium hydrate below 10°C. Carbon dioxide is passed into the chilled solution of venom with which this adsorbent is mixed until it is neutral to phenol red. It is allowed to stand in the cold for eighteen hours before centrifuging.

Mr. Holden has devised a method for rapid evaporation at ordinary temperatures of large quantities of venom solution without frothing, by evaporating from the surface only. This was done by enclosing in the vacuum oven an electric heating unit above the surface of the liquid, while immediately below

it was the cooling unit, a copper tube through which water circulated. The yield of dry venom fraction so obtained amounted to from 50 to 75 % of the weight of the original venom. Micro Kjeldahl estimations indicated that there was no serious inorganic contamination from the adsorbent, and that there was no appreciable loss of protein from the venom. The fraction as tested by subcutaneous injection into animals was nearly as active (90%-100%) as the original venom.

The fractions of black snake, tiger snake, and black tiger snake venoms prepared in this way contained only traces of thrombin.

The problem of separating the venoms of Australian snakes into fractions with different pharmacological actions was further investigated. After a series of experiments, methods based on differential ultrafiltration through pyroxylin membranes at low pressures and through gelatine membranes at high pressures were rejected as unsuited for the purpose, and attention was devoted to the possibilities of preferential adsorption. A large number of substances were tried, and it was found that Barium carbonate, specially prepared in a very fine state of division, would adsorb in neutral solution the thrombin of the venoms of the tiger snake, black tiger snake, and black snake, while it adsorbed little of the "neurotoxic" fractions. It was necessary to have the venom in very dilute solution (0-1%). The problem of evaporating the water from the dilute solution of "neurotoxin" resulting from this treatment was solved by the method of surface evaporation *in vacuo* in a special oven designed and partly constructed in the department, in which the venom solution was placed in a shallow dish immediately under an electric radiator and over a condenser cooled internally by water, thus eliminating the retarding effects of the connecting tube between the still and condenser, and the frothing, which rendered distillation *in vacuo* impracticable. The "neurotoxin" was finally recovered as a fine white powder by drying the concentrated solution below 0°C. in a high vacuum, and had a high potency. Yields up to 70% were obtained.

Publication.

Holden, H. F.:

"The Fractionation of Australian Snake Venoms."

ii. The Venom of the Tiger Snake (*Notechis scutatus*), Black Tiger Snake (*Notechis scutatus var. niger*), and Black Snake (*Pseudechis porphyriacus*). "The Australian Journal of Biology and Medical Science," Vol. xi, 1933, page 1.

Proteins of Ox Serum.

The work done in the department during the last four years on the problems of the separation of the proteins of mammalian

sera has reached a state suitable for publication. The so-called "individual" proteins of ox serum or plasma are inconstant mixtures with varying specific rotations. The supposed profound influence of traces of lipoids on the rotations is shown to rest on slight evidence. It is suggested that euglobulins are mixtures of pseudo-globulins with meta-proteins. Artificial mixtures of native and denatured proteins were prepared which possessed properties similar to those of euglobulins in their solubility in salt solutions and precipitation on dialysis. Many experiments on the mutual solubility or precipitation of two proteins were performed. The solubility of casein in sodium chloride solution was examined, and an explanation suggested on the lines of that proposed for the behaviour of euglobulins.

Publication.

HOLDEN, H. F., and FREEMAN, MAVIS:

"Observations on the Proteins of Ox Serum." "Australian Journal of Biology and Medical Science" (in the press).

Immunity in Staphylococcal Infections.

Dr. Connor and Miss McKie have continued Dr. Burnet's studies on staphylococcal infections. They have concerned themselves in animal experiments with methods of immunisation against infection; with the degree of immunity, as judged by tests of antihaemolytic titre, occurring in acute and chronic infections in man, and particularly with methods of treatment designed to raise the immunity response.

It was found possible to confer complete immunity against staphylococcal infection in rabbits by injections of living staphylococci followed by injections of staphylococcal anatoxin.

Anatoxin injections have been used in man in the treatment of superficial staphylococcal infections (30 cases) with marked clinical improvement in all cases. The work is being continued.

Chronic Paronychia due to Monilia.

Dr. Connor has investigated a series of cases of chronic paronychia and isolated *Monilia albicans* in pure culture from thirteen cases.

The strains have been studied with regard to pathogenicity in rabbits, and their biochemical and serological reactions recorded. Treatment of this condition has been investigated and discussed in a publication at present in the hands of the Editor of the "Medical Journal of Australia."

Publication.

CONNOR, J. IVAN:

"Chronic Paronychia Due to Monilia." "Medical Journal of Australia" (in the press).

Favus.

Dr. Ivan Connor investigated an epidemic of ringworm occurring in mice during the mouse plague of last year, and in men infected by handling contaminated wheat. He isolated from both sources *Achorion quinckeanum*, and was able to infect laboratory mice producing lesions similar to those observed in wild mice. The disease has probably been prevalent among wild mice, at least since 1917, when a similar epidemic occurred, during which Dr. Lawrence isolated the fungus.

The lesions in man were also studied. Only a small proportion of men exposed to infection appear to contract the disease. The most efficient methods of treatment were also explored.

Publication.

Connor, J. Ivan:

"Favus in Mice and Men." "Medical Journal of Australia," 24th December, 1932.

Anterior Poliomyelitis.

Further work on the relationship of virus of poliomyelitis, Australian and Rockefeller strains, has been carried out, and work on the virucidal power of pooled normal serum has been completed. The neutralising power of pooled serum from 32 normal adults (non-contacts) was found to be 30-40 % of that of convalescent serum. This work, by Dr. Southby and Miss Margot McKie, is reported in an article at present in preparation for the press.

The Sterilisation of Catgut.

Though there have been no cases of tetanus at the Melbourne Hospital attributable to infected catgut, the occurrence of a case of tetanus at another hospital led to the examination of our routine methods of sterilisation. Catgut was contaminated with tetanus spores, and then put through the routine biniodide spirit sterilisation. This method was found to be inefficient for sterilisation. Aqueous iodine-iodate-glycerol solution, recommended in the M.R.C. special report No. 138 (1929), was also tested, and found to be efficient, and this method of sterilisation has replaced the older one.

Publication.

Cooper, E. L., and Williams, F. Eleanor:

"The Sterilisation of Catgut." Melbourne Hospital Clinical Reports, 1932, 3, 14.

Bacteriological Investigation of a Commercial Sample of Modified Snake Venom.

Three bottles of a solution of modified snake venom for the treatment of epilepsy were submitted to us for investigation.

Miss Freeman found that the remedy contains 1.2 mgm. of dry substance and 0.075 mgm. of nitrogen per cc., corresponding to a content of venom or venoms of about 0.5 mgm. per cc. It contains phenol and about 10% of glycol or glycerine. A few pharmacological tests suggested that the venom used in its manufacture was viperine.

The manner in which the preparation was put up was unsatisfactory, materials for a course of injections extending over some months being enclosed in a bottle covered with a rubber stopper, which did not fit very tightly, and was not wired on. For sterility and protection against organisms introduced during the withdrawal of doses, reliance had been placed upon the phenol in the mixture, which was shown to be sufficient to kill added organisms (Streptococci, staphylococci or B. coli) in four days. This was obviously inefficient against spore-forming bacilli, since the contents of all three bottles examined were found to be contaminated with living spores of anaerobes, two of them with those of *Vibrion septique.*

The organisms isolated were of some interest because of their probable origin from the venom used in preparation. All three samples contained a terminal sporing non-pathogenic organism closely resembling *B. cochlearius* (Douglas, Fleming and Colebrook). Morphologically the similarity was exact, but our organism differs in its sluggish motility, in the opacity of the colonies on solid media, and in its ability to coagulate milk and liquify gelatine. Our strain of *Vibrion septique* presented also a difference from the classical description of the organism—it fermented saccharose and not galactose. It was, however, highly pathogenic, and its effects were nullified by mixed anti-*Vibrion septique,* anti-*welchii*, antitoxic serum. The third organism present in two out of three samples was *B. subtilis.*

Publication.

Kellaway, C. H., and Williams, F. Eleanor:

"An Investigation of a Commercial Sample of Modified Snake Venom." "Medical Journal of Australia," 13th May, 1933, p. 581.

Coramine.

During the course of work on the action of snake venoms in causing failure of respiratory movement, use was made of Coramine to counteract excessive dosage of anaesthetic. It was found to intensify the motor phrenic impulses in animals in which the respiratory centres had been depressed and the phrenic impulses weakened or abolished by excess of anaesthetic. It has, however, only a temporary and trivial action in respiratory failure

due to overdosage of the barbituric acid derivatives—dial and amytal.

Some further observations were made concerning its action in counteracting local anaesthesia of the bulbar centres by percaine. It was found to be sometimes, but not invariably, successful in overcoming histamine shock produced in animals anaesthetised with ether.

Coramine has been greatly vaunted as a cardiac stimulant, but it appears to have little direct effect upon normal heart mammalian muscle, nor does it apparently owe its successful clinical application in cardiac disease to any improvement of nutrition by increasing the flow through the coronary vessels.

Publication.

Kellaway, C. H.:

"Some Observations on Coramine." "Melbourne Hospital Clinical Reports," Vol. iii, 1932, No. 2.

Hypersensitiveness to Insulin.

An interesting case of a woman who had had diabetes for nine years, and was hypersensitive to insulin, was reported. Severe allergic reactions followed insulin treatment, and attempts to treat her with it had been discontinued. Commencing with a minute dose (1/20,000 unit), and increasing gradually over a three months' period, it was possible ultimately to give a dose of 20 units daily, which kept the diabetes in check, and the general health of the patient has been much improved.

Publication.

Bryce, Lucy M.:

"Hypersensitiveness to Insulin." "Medical Journal of Australia," 25th March, 1933, p. 271.

Prognosis in Glycosuria.

An investigation into forty cases of glycosuria which had been under observation over a period of years has been completed. The cases were biochemically investigated by the glucose tolerance test, and their previous history and present condition examined.

Patients suffering from infections and trauma comprised the most interesting groups, particularly the latter, as very few cases are reported in the literature. The class of patient presenting a slightly abnormal glucose tolerance test presented a difficult problem, and ten cases were classed as potentially diabetic.

Publication.

COOPER ERIC L. and SPLATT, BERYL:

"The Prognosis of Glycosuria." "The Melbourne Hospital Clinical Report," Vol. iii, No. 2, December, 1932.

Parathyroid Tetany.

Dr. Keith D. Fairley reviewed the literature on Parathyroid tetany, with particular reference to the occurrence of cataract following injury to the parathyroid glands after thyroidectomy for goitre. Forty-six instances of such cataracts had been recorded, and details of two more were given.

Publication.

FAIRLEY, KEITH D.:

"Parathyroid Tetany and Cataract Following Subtotal Thyroidectomy." "Melbourne Hospital Clinical Reports," Vol. iii, No. 2, 1932, pp. 91-107.

Toxic Goitre.

In an address before the Victorian Branch of the British Medical Association, Dr. Wright-Smith reviewed briefly the pathology of this subject, and illustrated his remarks by an excellent series of photo-micrographs. He emphasised the essential unity of various types of toxic goitre—the rarity of true adenoma and the misleading nature of the term "toxic adenoma." He discussed the work of Marine, Reinhoff, and others, on the hyperplasia-involution process, the appearances found in compensatory hyperplasia, in toxic goitre, and in involution associated with the administration of iodine or due to other causes.

Publication.

WRIGHT-SMITH, R. J.:

"Toxic Goitre." "Melbourne Hospital Clinical Reports," 1932, 3, 17.

Brain Tumours.

At a Staff meeting, Dr. Wright-Smith showed fourteen specimens, illustrating various types of intracranial tumours. Four of these, a meningioma, a spongio-blastoma multiforme, a pinealoma, and an astrocytoma, are reported with clinical notes and photographs of the morbid appearances presented.

Publication.

WRIGHT-SMITH, R. J.:

"Demonstration of Pathological Specimens." "Melbourne Hospital Clinical Reports," 1932, 3, 29.

Morbid Anatomy.

During the year 527 autopsies were performed, and of these 436 by Dr. Wright-Smith. Dr. C. H. Mollison and Dr. Wright-Smith were responsible for the examination of biopsy material. The macroscopic and microscopic photography has been carried out by Miss Helen Wischusen.

Histological examinations for the diagnosis of pathological material by Dr. C. H. Mollison and Dr. Wright-Smith numbered 1006. In addition, 472 histological sections of post-mortem material were made.

Museum.

We are indebted to Dr. C. H. Mollison, Mr. A. Newton, Mr. B. T. Zwar, Dr. Roy Chambers, and Mr. Julian Smith for the gift of rare specimens.

Forty-three new specimens have been added during the past year, including examples of diverticula of the appendix, carcinoma of the jejunum, polycystic disease of the liver and kidneys, branchial cyst, sarcoma of prepatellar bursa, and fibro-sarcoma of tendon sheath.

The museum has been widely used by the hospital honorary staff, by University lecturers, and by candidates for higher degrees.

Bacteriology and Clinical Pathology.

The diagnostic work in bacteriology, serology and haematology has been carried out by Drs. Bryce and Gardner. The typing of donors for the Red Cross Voluntary Blood Transfusion Service has been continued by Dr. Bryce, who has also carried out diagnostic skin tests and some therapeutic immunisation in allergic cases.

At the end of 1932 Miss Margaret Green, B.Sc., who had been working voluntarily in the department, left to take up the position of Assistant Bacteriologist at the Children's Hospital. We congratulate her on her appointment, but miss her capable assistance.

Miss Williams has, as heretofore, been responsible for a number of special serological tests, which include complement fixation tests for hydatid, 156; Wassermanns, 572; bilharzia, 3, and for gonococcal disease, 28.

Biochemistry and Basal Metabolism.

The total number of patients examined was 3646, in comparison with 2843 last year (an increase of 28%): 2322 in-patients, involving 3347 tests and 5228 analyses, and 1324 out-patients, involving 1626 tests and 4578 analyses, a total number of 9806 analyses compared with 7017 in 1931-32 (an increase of 25%).

The work of the department has been on the same lines as previously. The proved tests, such as glucose tolerance tests, renal efficiency tests and cerebro-spinal fluid analyses, comprised the major portion of the work.

In the metabolic department the work has been carried out as hitherto, the large number of out-patients requiring Basal Metabolic Rate determinations making it necessary to use the Balance room for examination, as well as the Metabolic room proper.

Electrocardiography.

The routine work of the Electrocardiography Department has been carried on by Mr. E. Hughes, who is now attending the Hospital on three days a week, instead of two.

Casoni Reaction.

The intradermal test for hydatid disease was performed on 194 occasions by Dr. Wright-Smith, with 12 positive results and 182 negative.

Teaching.

The course of Post-Graduate Lectures arranged by the Melbourne Permanent Post-Graduate Committee was delivered in November, 1932, by Dr. Kellaway. The lectures on the following subjects were most interesting, and were very well attended: —Acidaemia and alkalaemia, shock, anoxaemia and cyanosis, cardiac failure, intestinal obstruction, and disorders of Ca-metabolism.

During the year demonstrations in Morbid Anatomy were given to fourth year students, and lectures in elementary bacteriology to the nursing staff, by Dr. Wright-Smith.

Practical experience in Clinical Pathology has been gained by hospital registrars, and by the sixth year students, under the direction of Drs. Bryce and Gardner.

The Library.

Our thanks for the gift of journals and books are due to the following:—

Dr. S. O. Cowen, Miss Danks, Dr. K. D. Fairley, Dr. C. H. Mollison, L'Académie Royale de Medicine de Belgique, the Commonwealth Department of Health, The Council of Scientific and Industrial Research, the National Institute of Medical Research (London), the Royal Society of New South Wales, the Medical Society of Victoria, the Rockefeller Institute (New York), la Société Royal des Sciences Médicales, Cancer Research Committee (Sydney), Universities Biblioteket (Lund, Sweden).

Walter and Eliza Hall Institute of Research in Pathology and Medicine

FINANCIAL STATEMENT FOR THE YEAR ENDED 30th JUNE, 1933.

INCOME ACCOUNT.

RECEIPTS.

To Balance brought forward, 30th June, 1932				£4,373	14	2
Trustees Walter & Eliza Hall Trust	£3,200	0	0			
University of Melbourne	750	0	0			
Trustees late Alfred Felton	240	0	0			
Trustees late Alfred Felton for apparatus	100	0	0			
Trustees late T. G. Sumner	20	0	0			
Trustees late Anthony Mackie	101	1	0			
Hoyt's Theatres and Associated Theatres	1	1	0			
A. M. Nicholas	12	4	4			
G. R. Nicholas	5	5	0			
Fees and Proceeds of Materials Supplied	154	2	4			
Interest on Investments	100	11	8			
				4,684	5	4
				£9,057	19	6

EXPENDITURE.

By Apparatus	£226	18	0			
Fittings and Equipment	18	1	0			
Repairs to Apparatus	8	18	8			
Repairs to Buildings	16	1	5			
Materials	386	16	2			
Publications	46	7	6			
Salaries and Wages	3,944	19	4			
Sundries	133	4	3			
Biochemical Department	449	0	7			
				£5,230	6	11
Balance—						
Fixed Deposit, 3%	1,000	0	0			
Fixed Deposit, 2¾%	500	0	0			
Credit Foncier Debenture Stock, £4/1/4%	875	0	0			
Cash with Agent-General, London	100	0	0			
E., S. & A. Bank, Current A/c.	100	0	0			
Bank of New South Wales, Current A/c.	1,252	12	7			
				3,827	12	7
				£9,057	19	6

THE ELSIE MARION CARTY FUND.

To Trustees late E. M. Carty	£345	1	2	By Balance	£345	1	2

BIOCHEMICAL ENDOWMENT ACCOUNT.

To Balance brought forward from 30th June, 1932	£8,591	10	3	By Bank Charges		£1	12	6
Interest on Investments	382	9	8	Transferred to Biochemical Dept. A/c.		380	17	2
				Balance—				
				Com'wealth Ins. Stock—				
				4%, 15/12/38	£200 0 0			
				4%, 15/11/41	300 0 0			
				4%, 15/10/44	140 0 0			
				City of Melb. Debentures, 5½%, 1937 . .	807 12 2			
				M. & M. Board of Works—				
				Inscr. Stock, 4%, 1945	1,218 4 3			
				Inscr. Stock, 6½%, 1937	1,952 11 1			
				Melb. Harbour Trust Debs. 5⅝%, 1949 . .	500 0 0			
				Credit Foncier Debenture Stock, £4/1/4%, 1941	621 5 0			
				Mortgage, £5/0/9 % . .	2,550 0 0			
				Mortgage, £5/8/6 % . .	300 0 0			
				Bank of New South Wales	1 17 9			
						8,591	10	3
	£8,973	19	11			£8,973	19	11

BIOCHEMICAL DEPARTMENT ACCOUNT.

To Interest Endowment Account	£380	17	2	By Materials, etc.	£6	0 11
Transfer from Working Account	449	0	7	Salaries, and Wages	823	16 10
	£829	17	9		£829	17 9

LIBRARY ACCOUNT.

To Balance brought forward, 30th June, 1932	£2,066	2	2	By Books, Journals and Bookbinding . .			£92	9 9
Interest on Investments	95	9	10	Balance—				
				Com'wealth Ins. Stock—				
				4%, 15/12/38	£200	0 0		
				4%, 15/11/41	300	0 0		
				4%, 15/10/44	530	0 0		
				Mortgage, £5/8/6 % . .	1,000	0 0		
				Bank of New South Wales	39	3 0		
							2,069	3 0
	£2,161	12	0				£2,161	12 0